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(54) Title of the Invention: Road marking material

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SPECIFICATION

1. Title of the Invention

Road marking material

2. Scope of the Patent Claims

(1) Road marking material, characterized in that from 1 to 50 parts by weight of a bisamide of melting point from 110 to 160°C are compounded per 100 parts by weight of binder resin.

3. Detailed Description of the Invention

Industrial Field of Application

The invention concerns road marking materials.

Prior Art

Conventional hot-melt type road marking materials have been designed in consideration of the temperature conditions (air temperature and road surface temperature) during each season, the road surface conditions and the time at which traffic movements start. For example, in summer the air temperature is high and the time at which traffic starts to move and contamination present problems and so for a summer grade material the amount of binder resin compounded is increased and the amount of plasticizer is reduced and the compound is designed so that the drying time is shortened and with contamination in mind, but if a summer grade material is used in winter then cracking occurs and so the material cannot be used in the winter period.

On the other hand, in winter the air temperature is low and there is some concern with respect to cold cracking and so the amount of plasticizer is increased in a winter grade to impart plasticity, but as a result of increasing the amount of plasticizer the drying properties and contamination resistance are markedly reduced if the material is used during the summer and so the material cannot be used in the summer season.

Problems to be Resolved by the Invention

Hence, in the past materials have been devised to match each season and consideration has been given to production and use, but if it was possible to achieve a material which matched both seasons there would be a great advantage in terns of production, use and quality, but nothing has been settled in this connection.

The present invention is the result of a thorough investigation carried out with a view to resolving the abovementioned unsettled state, and it is intended to provide

road marking materials which have a balance of drying properties, contamination resistance and cracking properties.

Means of Resolving These Problems

The invention concerns road marking material which is characterized in that from 1 to 50 parts by weight of a bisamide of melting point from 110 to 160°C are compounded per 100 parts by weight of binder resin.

The bisamides which are used in the invention are already known compounds, obtained by the condensation reaction between an acid and an amine, and they are white waxy compounds which have a high melting point.

A long chain fatty acid is used for the acid, and examples include oleic acid, behenic acid, stearic acid, lauric acid and sebacic acid.

Aliphatic diamines can be used for the amine, and examples include methylenediamine, ethylenediamine, trimethylenediamine, tetramethylenediamine, pentamethylenediamine, hexamethylenediamine, 1,7-diaminoheptane, 1,8-diamino-octane, 1,9-diaminononane and 1,10-diaminodecane. From among these, ethylenebislauric acid amide of melting point 157°C obtained from lauric acid and ethylenediamine, hexamethylenebisstearic acid amide of melting point 146°C obtained from stearic acid and hexamethylenediamine, and ethylenebisstearic acid amide of melting point 143°C obtained from stearic acid and ethylenediamine, for example, are especially desirable in the road marking materials of this invention.

Furthermore, aromatic bisamides (for example, m-xylenebisstearic acid amide, N,N'-distearylisophthalic acid amide, N,N'-stearylterephthalic acid amide and the like) can also be used, but the weather resistance tends to be markedly poorer than with the aliphatic bisamides.

The amount of bisamide compounded is from 1 to 50 parts by weight, and preferably from 5 to 30 parts by weight, per 100 parts by weight of binder resin.

With less than 1 part by weight the drying properties and contamination resistance are inadequate, and if the amount compounded exceeds 50 parts by weight then low temperature cracking occurs.

Furthermore, the melting point of the bisamide which is used in the invention is from 110 to 160°C. If the melting point is below 110°C then there is little improving effect on the drying properties and contamination resistance, and if it exceeds 160°C then cracking occurs at low temperatures.

Known materials can be used for the other components which are used in the invention.

One type, or two or more types of binder resin selected from among rosin, malaeinated rosin, malaeinated rosin esters and the hydrogenated resins derived therefrom, petroleum resins, polyamide resins, saturated polyester resins and the like can be used for the binder resin.

The amount of binder resin compounded is preferably from 10 to 20 wt% with respect to the whole of the road marking material. If the amount of binder resin compounded is less than 10 wt% then the fluidity and adhesion properties of the road marking material tend to be poor. Furthermore, if the amount compounded exceeds 20 wt% then the fluidity and the binding properties are good but the contamination resistance tends to decline.

Vegetable oils, vegetable oil modified alkyd resins, mineral oils, phthalic acid esters, epoxy oils and liquid synthetic rubbers, for example, can be used individually as plasticizers, or two or more such plasticizers can be used conjointly. The amount of plasisticizer compounded is preferably from 0.5 to 5 wt% with respect to the whole of the road marking material. If the amount compounded is less than 0.5 wt% then the adhesion properties and the low-temperature cracking resistance and the fluidity tend to be poor, and if it exceeds 5 wt% then the contamination resistance and the drying properties tend to be poor.

White pigments such as titanium dioxide, flowers of zinc, lithopone and white lead, and yellow pigments such as yellow lead (heat resistant yellow lead), yellow organic pigments, titanium yellow and yellow iron oxide are used in the main as the colouring pigments. The amount of pigment compounded is preferably from 1 to 10 wt% with respect to the whole of the road marking material. If the amount compounded is less than 1 wt% then the colouring power and the covering power are slight and the visibility tends to be poor, and if it exceeds 10 wt% then the visibility is satisfactory but the visibility stays the same and the increase is without significance and greatly increases the cost.

Moreover, calcium carbonate, silica, white marble, glass powder, alumina and the like can be used as inorganic fillers, either individually or conjointly. The amount compounded is preferably from 40 to 65 wt% with respect to the total weight of the road marking material. With less than 40 wt% the contamination resistance

and the wear resistance tend to be poor, and with more than 65 wt% the low temperature cracking properties and adhesion properties tend to be poor.

Moreover, glass beads (glass beads of JIS R 3301) are compounded in an amount of from 15 to 30 wt% with respect to the total weight of the road marking material as laid down in JIS K 5665 as a reflecting agent.

In addition, anti-settling agents, antioxidants and the like can be used as auxiliary materials.

The materials are compounded in a mixer, for example, to form a road marking material.

In this invention the abovementioned mixture can also be packed into the bag of a melting-bag system (melted as a bag) for use.

Illustrative Examples

The invention is described below by means of illustrative examples, but the invention is not limited by these illustrative examples. Moreover, in the examples the term "parts", in the absence of any indication to the contrary, signifies "parts by weight".

Example 1

a. "Suribax L" (Melting point 157°C) (Ethylenebislauric acid amide, trade name of the Nippon Kasei Kogyo Co.)	1.5 parts
b. Binder Resin (Acid modified aliphatic petroleum resin "Kuinton C-200S", trade name of the Nippon Zeon Co.)	15 parts
c. Placticizer (Soy bean oil modified alkyd resin, "FT280-100", trade name of the Hitachi Kasei Kogyo Co.)	3 parts
d. Colouring Pigment (Titanium dioxide)	5 parts
e. Inorganic Filler (Calcium carbonate/white marble = 1/1 by weight)	59.5 parts
f. Reflecting Material (Glass beads of diameter from 0.105 to 0.84 mm)	16 parts

The abovementioned components a to f were mixed together in a mixer and then the mixture was introduced into a mobile kneader and melted and coated onto a

freshly laid asphalt road surface at a temperature of from 180 to 200°C in such a way as to provide a film thickness of from 1.5 to 1.7 mm.

After coating, the drying time, contamination resistance and cracking properties (with the passage of time) were investigated and the results are shown in Table 1 (tests carried out at an air temperature of 30°C and a road surface temperature of 45°C).

Example 2

a. "Suribax E" (Melting point 143°C) (Ethylenebis-stearic acid amide, trade name of the Nippon Kasei Kogyo Co.)	3 parts
b. Binder Resin (Acid modified aliphatic petroleum resin "Kuinton C-200S", trade name of the Nippon Zeon Co.)	15 parts
c. Placticizer (Soy bean oil modified alkyd resin, "FT280-100", trade name of the Hitachi Kasei Kogyo Co.)	3 parts
d. Colouring Pigment (Titanium dioxide)	5 parts
e. Inorganic Filler (Calcium carbonate/white marble = 1/1 by weight)	58 parts
f. Reflecting Material (Glass beads of diameter from 0.105 to 0.84 mm)	16 parts

The abovementioned components a to f were mixed together, melted, coated and tested in the same way as in Example 1. The results are shown in Table 1.

Comparative Example 1 (Conventional Product, Summer Grade)

a. Binder Resin (Acid modified aliphatic petroleum resin "Kuinton C-200S", trade name of the Nippon Zeon Co.)	15 parts
b. Placticizer (Soy bean oil modified alkyd resin, "FT280-100", trade name of the Hitachi Kasei Kogyo Co.)	1.5 parts
c. Colouring Pigment (Titanium dioxide)	5 parts
d. Inorganic Filler	62.5 parts

(Calcium carbonate/white marble = 1/1 by weight)

e. Reflecting Material 16 parts

(Glass beads of diameter from 0.105 to 0.34 mm)

The abovementioned components a to f were mixed together, melted, coated and tested in the same way as in Example 1. The results are shown in Table 1.

Comparative Example 2 (Conventional Product, Winter Grade)

a. Binder Resin 14 parts

(Acid modified aliphatic petroleum resin "Kuinton C-200S", trade name of the Nippon Zeon Co.)

b. Placticizer 2.5 parts

(Soy bean oil modified alkyd resin, "FT280-100", trade name of the Hitachi Kasei Kogyo Co.)

c. Colouring Pigment 5 parts

(Titanium dioxide)

d. Inorganic Filler 62.5 parts

(Calcium carbonate/white marble = 1/1 by weight)

e. Reflecting Material 16 parts

(Glass beads of diameter from 0.105 to 0.84 mm)

The abovementioned components a to f were mixed together, melted, coated and tested in the same way as in Example 1. The results are shown in Table 1.

Table 1

Item		Example 1	Example 2	Comp.Ex.1	Comp.Ex.2
Drying Time		2 min.	2 min.	1 Min. 45 sec.	4 min.
Contamination Resistance		O	O	O	X
Cracking Resistance	After 1 month	O	O	X	O
	After 2 months	O	O	XX	O
	After 3 months	O	O	XX	O

Test Methods

Drying Time:

The time after coating after which tyre tracks are not produced.

Contamination Resistance

The state of contamination after 30 reciprocations with a 3.5 tonne weight after each drying time after coating.

O: No contamination

X: Contaminated and black all over

Cracking

The coated road surface was checked after 1, 3 and 6 months and assessed in respect of the presence or otherwise of cracking.

O: No cracking had occurred.

X: One to three cracks had formed per 5 m.

XX: Four or more cracks had formed per 5 m.

Effect of the Invention

As is clear from test results outlined above, the road marking materials of this invention have good drying properties and contamination resistance, and a good balance with cracking, and they can be used in all seasons and so they are very convenient in terms of production and use.

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